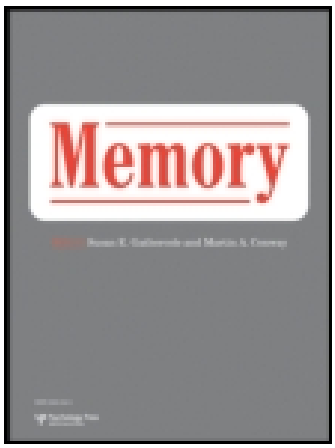
This article was downloaded by: [The University of Manchester Library]
On: 07 December 2014, At: 23:42
Publisher: Routledge
Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Memory
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/pmem20

Compelling untruths: The effect of retention interval on content borrowing and vivid false memories

James Michael Lampinen [a] , D. Brent Ryals [a] & Keaton Smith [a]
[a] University of Arkansas , Fayetteville, AR, USA
Published online: 19 Feb 2008.

To cite this article: James Michael Lampinen , D. Brent Ryals & Keaton Smith (2008) Compelling untruths: The effect of retention interval on content borrowing and vivid false memories, Memory, 16:2, 149-156, DOI: 10.1080/09658210701839277

To link to this article: http://dx.doi.org/10.1080/09658210701839277

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at http://www.tandfonline.com/page/terms-and-conditions

MEMORY, 2008, 16 (2), 149–156

Psychology Press
Taylor & Francis Group

Compelling untruths: The effect of retention interval on content borrowing and vivid false memories

James Michael Lampinen, D. Brent Ryals, and Keaton Smith
University of Arkansas, Fayetteville, AR, USA

Downloaded by [The University of Manchester Library] at 23:42 07 December 2014

False memories are sometimes vivid and detailed. We proposed that the details that come to be associated with false memories may be produced by a process called content borrowing. In content borrowing, details from presented items are erroneously borrowed to corroborate the occurrence of the false memory item. In the present research we used think-out-loud protocols at both study and test to provide evidence for content borrowing in the DRM paradigm. We also demonstrated that content borrowing was more common after a 2-week delay, and was more common for critical lures than for missing exemplars.

False memories have attracted considerable theoretical, applied, and empirical attention during the last 20 years. The occurrence of false memories has been seen as a window into the nature of memory processes more generally. Examination of these processes has accelerated in the past decade with the introduction of a powerful laboratory technique that can be used to produce robust false memories for words. The technique has been called the DRM paradigm, after its developers Deese (1959), and Roediger and McDermott (1995). In the DRM paradigm, participants study lists of words such as *nurse*, *sick*, *lawyer*, *medicine*, *health*, and so on, such that each of the study items is associatively related to a non-presented critical lure (e.g., *doctor*). The false memory effect produced in the DRM paradigm is robust, easy to replicate, and produces false memories that are subjectively compelling to participants. In the present article we focus on a process called *content borrowing* (Lampinen, Meier, Arnal, & Leding, 2005a), which involves borrowing features from presented items in order to provide false corroboration for the occurrence of the false memory item on the study lists.

A number of research findings converge on the conclusion that false memories produced in the DRM paradigm can be experienced in a vivid and detailed manner (Lampinen, Neuschatz, & Payne, 1998). Recently, Brainerd, Wright, Reyna, and Mojardin (2001) have coined the term *phantom recollection* to refer to these subjectively compelling false memories. A number of researchers have used Tulving's (1985) remember–know distinction and have demonstrated that false recognition of the critical lure is often experienced in the remember sense (e.g., Payne, Elie, Blackwell, & Neuschatz, 1996; Pesta & Murphy, 2001; Roediger & McDermott, 1995). Moreover, evidence indicates that although warnings can sometimes reduce the false memory effect, they far from eliminate them (Gallo, Roberts, & Seamon, 1997; Gallo, Roediger, & McDermott, 2001; McDermott & Roediger, 1998; Neuschatz, Benoit, & Payne, 2003; Neuschatz, Payne, Lampinen, & Toglia, 2001). Participants claim to remember specific details about the presentation of the critical lure such as which of two or more speakers presented the word (Lampinen et al., 1998; Payne et al., 1996), or where the word was on the list (Read, 1996). Evidence using

Address correspondence to: James Michael Lampinen, Department of Psychology, 216 Memorial Hall, University of Arkansas, Fayetteville AR 72701, USA. E-mail: lampinen@uark.edu

© 2008 Psychology Press, an imprint of the Taylor & Francis Group, an Informa business
http://www.psypress.com/memory
DOI:10.1080/09658210701839277

Downloaded by [The University of Manchester Library] at 23:42 07 December 2014

multinomial modelling techniques (Brainerd, Payne, Wright, & Reyna, 2003; Brainerd et al., 2001) and ROC modelling techniques (Lampinen, Odegard, Blackshear, & Toglia, 2005b; Lampinen, Odegard, & Neuschatz, 2004; Lampinen, Watkins, & Odegard, 2006) have confirmed that false memories appear to behave similarly to veridical memories for which conscious recollection is occurring.

The vivid and detailed phenomenology that accompanies some false memories is a finding that requires a theoretical accounting (Lampinen & Odegard, 2006). One aspect of this problem is understanding why participants claim to be able to recall specific details associated with the presentation of an item that in point of fact was never presented. One candidate answer to this question is provided by the familiarity plus corroboration model (Lampinen, 1996; Lampinen, Faries, Neuschatz, & Toglia., 2000; Lampinen et al., 2005a; Lampinen, Neuschatz, & Payne, 1999; Odegard & Lampinen, 2004). The familiarity plus corroboration model starts with the assumption that similarity between the original study items and the critical lure can lead to strong feelings of familiarity. This familiarity may be the result of conceptual activation (i.e., activation from studying semantically related items) or perceptual activation (i.e., when items are phonologically similar). According to the model, strong feelings of familiarity can lead to a biased search for episodic memory for details that would corroborate the feeling of familiarity. Features from items that were actually studied can sometimes serve as corroboration for the occurrence of the non-presented critical lure. A large variety of details such as thoughts, emotions, and perceptual details can all serve as errant corroboration for a false memory item. For example, imagine that upon studying the word ''mad'' a participant thinks, ''I'm really mad about the grade I got on my last exam.'' If the participant later takes a recognition memory test containing the critical lure ''anger'', the participant might think, ''I remember 'anger' because I remember thinking about how angry I am about the grade I got on my last exam.'' This process has been called *content borrowing* because experiential details from presented items are borrowed to vindicate the participant's belief in their false memory (see also Gallo & Roediger, 2003; Reyna & Kiernan, 1995).

Direct evidence for content borrowing was recently uncovered in a study by Lampinen et al. (2005a). Participants studied DRM lists on a computer at a self-guided pace while thinking out loud for the experimenter. Once the participants had finished the study phase, they then took a paper and pencil test over the DRM lists, again while thinking out loud. Examination of the think-out-loud protocols provided clear evidence for content borrowing. For instance, in response to the word *sugar* during the study session, one participant said, ''It's fattening but good'' while thinking out loud. At time of test, when presented with the critical lure *sweet* the participant said, ''I remember liking sweets but thinking they're gonna make me fat.'' Overall, fully one third of all false remember judgements were coded as involving clear examples of content borrowing, and approximately two-thirds of all false remember judgements included either clear cases of content borrowing or likely cases of content borrowing.

The present research examines two predictions of the familiarity plus corroboration model with regard to the production of content borrowing. First, because content borrowing involves taking details from actually presented items, one prediction made in the present article is that as time passes the details associated with an item's presentation will become less strongly associated with that item and more easily borrowed by other items. Thus, content borrowing should more commonly occur after long retention intervals than shorter retention intervals. Second, the research examines the role of familiarity in driving content borrowing. Previous research (e.g., Brainerd, Holliday & Reyna, 2004) has made a distinction between false memories that form the theme of the presented list (i.e., critical lures) and false memories to other items that are more loosely related to the presented lists (i.e., missing exemplars; Brainerd et al., 2001). For instance, if presented with the word list *bed*, *rest*, *nap*, *snooze*, *slumber*, *doze*, *pillow*, the critical lure will be *sleep* because it is the word to which all the other words are closely associated. A word like *dream* fits on the list but does not represent the central theme of the list as well as the word *sleep*. In past research, words like *dream* have been termed missing exemplars and it has been found that missing exemplars are less likely to be falsely recognised than critical lures. DRM lists are constructed such that all of the words on the list are related to the critical lure. Thus, the critical lure is likely to evoke very strong feelings of familiarity at test. DRM lists are not constructed

Downloaded by [The University of Manchester Library] at 23:42 07 December 2014

to maximise the inter-item association of list items. Because missing exemplars are simply non-presented list items, and list items are not necessarily strongly related to each other, missing exemplars are unlikely to evoke as strong a feeling of familiarity as are critical lures. Because the familiarity plus corroboration model claims that the search of memory for corroborating details is driven by familiarity, it follows that content borrowing should be more common for critical lures than for missing exemplars.

Participants in the present study were presented with DRM lists while thinking out loud. At time of test, participants made remember–know judgements while thinking out loud. This procedure allowed us to examine the presence of content borrowing by comparing what participants said for presented items during study with what they said in response to their acceptance of critical lures during test.

METHOD

Participants

A total of 38 students enrolled in an introductory psychology class participated in order to partially fulfil a research requirement.

Materials

Study lists consisted of the 16 DRM lists shown by Stadler, Roediger, and McDermott (1999) to produce the highest rates of false recognition. Our study lists consisted of the first 10 items from each of the lists. We used 10-item lists rather than 15-item lists because it decreased the total time on task for participants and made it easier to complete the task within the available experiment time. The 16 lists were broken into two sets of 8 with the lists equated in terms of their average strength (mean proportion of false recognition in the Stadler norms for both groups of lists was .78). For each participant one of the sets of eight lists was presented for study and the other set of eight lists were used to generate unrelated items for the recognition test. These lists were counterbalanced such that each list served equally often as a studied list and non-studied list. Each item was presented in size 24 font and was located in the centre of a computer screen. Experimenters moved the participants through each item by hitting the space bar after the participant completed their thoughts for that item.

A 64-item paper and pencil recognition test was taken by all participants. For each item, participants made OLD/NEW recognition judgements. For those items where the participant indicated ''OLD'', they were also asked to make a ''remember'' or a ''know'' judgement. The instructions provided in the appendix of Rajaram's (1993) article were used to explain the remember and know judgements to participants. Of the 64 items on the test, 32 items were based on the eight lists that the participant had studied and 32 were based on the eight control lists studied by other participants. For each studied list, the test included 2 presented items (i.e., 16 targets), the critical lure (i.e., 8 critical lures), and a non-presented item taken from the eleventh position in the Stadler norms (i.e., 8 missing exemplars). The test also included the corresponding items from each of the eight non-studied lists, resulting in 16 target controls, 8 critical lure controls, and 8 missing exemplar controls.

In order to provide participants practice with the think-out-loud and remember–know tasks, we had participants study and take a test over a list of celebrity names. The practice study list included 20 names. Participants were asked to think out loud as they were presented with these names using the same procedure they would later use on the DRM lists. The practice recognition test included 20 famous names, 10 of which had been studied and 10 of which had not been studied. Participants made OLD/NEW recognition judgements for each of these names, and if they indicated ''OLD'', they also made ''remember'' or ''know'' judgements.

Procedure

Upon arrival, participants were informed that they would be taking a memory test over several word lists. They were also informed that they would be thinking out loud while doing this task and that their responses would be tape recorded.

As a warm-up, participants were asked to think out loud as they answered the question of how many windows were in the house where they grew up. Participants were encouraged to say everything they were thinking, even if it seemed unimportant to them, and to continue speaking during the entire problem (see Ericsson & Simon,

Downloaded by [The University of Manchester Library] at 23:42 07 December 2014

1993). Next, participants studied the list of famous names. Celebrity names were presented on a computer screen and participants made pleasantness ratings using a 5-point scale as each name was presented. They were asked to think out loud as they made these judgements. Once the participants had finished making their judgements for each name, they moved on to the next name.

After participants completed the celebrity rating task, they performed the same task with the words from the eight DRM lists. Participants were seated at a desk directly in front of a computer monitor. Each word was presented sequentially in a blocked fashion. Again, participants provided pleasantness ratings for each word and were asked to think out loud as they did so. Note that the pleasantness rating was included merely to give participants a semantic task to work on that would engage them and give them something to talk about for each item. The pleasantness task was not used as an experimental manipulation (see Lampinen et al., 2005a).

Participants engaged in the recognition memory tests either during the same session or 2 weeks subsequent to the study session. The test session began with a practice recognition test over the previously studied celebrity names. Participants were provided with a sheet explaining the remember–know distinction (Rajaram, 1993) and were asked to read the instructions to themselves as the experimenter read them out loud. They were then asked to explain the remember–know distinction in their own words. Participants then took the practice test based on the famous names. As they took the test they were asked to think out loud, saying everything they were thinking as they decided whether an item was old or new, and everything they were thinking as they made the remember and know judgements. Following the practice test, participants were given the test on the list of words that they had studied earlier. Participants again proceeded at their own pace making old–new and remember–know judgements while thinking out loud.

RESULTS

In the present experiment participants were presented with eight DRM lists while thinking out loud. They then took a recognition test and made remember/know judgements while thinking out loud. Our main goal was to determine the degree to which participants engaged in content borrowing, by taking a thought that had originally been associated with a presented item and claiming to remember the thought in association with a false memory item. In particular, we sought to examine what effect long retention intervals would have on the occurrence of content borrowing. We predicted that content borrowing should increase across a long retention interval because details associated with true memories would become less strongly associated with their original source and thus more available for content borrowing. We also predicted that content borrowing should be more common for critical lures than for missing exemplars. We first present overall recognition data from the experiment as well as results of the remember–know task. We then discuss the degree to which content borrowing occurred for false remember judgements.

Overall recognition

We first analysed the effect of retention interval on corrected recognition. Corrected recognition scores were calculated by taking recognition rates for targets, critical lures, and missing exemplars from presented lists and subtracting recognition rates for target controls, critical lure controls, and missing exemplar controls respectively. These results are shown in Table 1. Recognition performance was analysed by means of a 2 (Retention Interval: Immediate, 2 Weeks) $\times$ 3 (Item Type: Target, Critical Lure, Missing Exemplar) mixed ANOVA. There was a main effect of item type on corrected recognition, $F(2, 72) = 3.64$, $MSE = .03$. Pairwise comparisons indicated that targets were recognised significantly more often than critical lures, $t(37) = 5.98$, and significantly more often than missing exemplars, $t(37) = 21.24$. Additionally, critical lures were recognised significantly more often than missing exemplars, $t(37) = 7.12$.

This main effect was qualified by a significant item type by retention interval interaction interactions, $F(2, 72) = 36.29$, $MSE = .03$. Pairwise comparisons indicated that corrected recognition of targets was greater for those participants tested immediately than for those participants tested after a 2-week retention interval, $t(36) = 10.86$. For missing exemplars, however, corrected recognition was greater for those participants tested after the 2-week delay than for those participants tested immediately, $t(36) = 4.12$. Retention interval had no significant effect on

TABLE 1
Mean proportion recognition and corrected recognition for Experiment 1

	Overall		*Remember*		*Know*	
	Immediate	*2-week*	*Immediate*	*2-week*	*Immediate*	*2-week*
Targets	.97 (.04)	.73 (.16)	.87 (.10)	.53 (.21)	.10 (.10)	.21 (.12)
Target controls	.04 (.09)	.25 (.17)	.00 (.00)	.12 (.10)	.02 (.03)	.13 (.10)
Target corrected	.95 (.05)	.48 (.18)	.87 (.10)	.41 (.20)	.09 (.11)	.07 (.13)
CLs	.47 (.25)	.86 (.16)	.30 (.16)	.56 (.23)	.17 (.21)	.30 (.17)
CL controls	.04 (.09)	.34 (.23)	.03 (.07)	.14 (.18)	.01 (.06)	.19 (.14)
CL corrected	.42 (.27)	.51 (.28)	.27 (.17)	.41 (.32)	.15 (.23)	.11 (.23)
MEs	.08 (.11)	.45 (.19)	.06 (.10)	.29 (.20)	.02 (.06)	.16 (.15)
ME controls	.06 (.06)	.26 (.17)	.04 (.06)	.16 (.16)	.02 (.05)	.11 (.14)
ME corrected	.01 (.12)	.18 (.14)	.01 (.12)	.14 (.17)	.00 (.06)	.05 (.14)

Standard deviations presented in parentheses. CL = Critical lures. ME = Missing exemplars.

Downloaded by [The University of Manchester Library] at 23:42 07 December 2014

the corrected recognition of critical lures, $t(36) = 1.05$, *ns*.

Remember judgements

A similar analysis was performed on corrected remember judgements. Corrected *remember* judgements were calculated by taking the proportion of *remember* judgements for targets, critical lures, and missing exemplars and subtracting the proportion of *remember* judgements for target controls, critical lure controls, and missing exemplar controls respectively. These results are shown in Table 1. Corrected *remember* judgements varied as a function of item type, $F(2, 72) = 117.31$, $MSE = .025$. Pairwise comparisons indicated that the corrected rate of remember judgements was greater for targets than for critical lures, $t(37) = 7.97$, and missing exemplars, $t(37) = 18.70$. Additionally, the corrected rate of remember judgements was greater for critical lures than missing exemplars, $t(37) = 6.33$.

This main effect was qualified by a significant item type by retention interval interaction, $F(2, 72) = 43.82$, $MSE = .025$. Pairwise comparisons indicated that the corrected rate of *remember* judgements for targets was greater for those participants tested immediately than for those participants tested after a 2-week delay, $t(36) = 8.91$. For critical lures, however, corrected rate of *remember* judgements was greater for those participants tested after the 2-week delay than for those participants tested immediately, $t(36) = 2.59$. Retention interval had no significant effect on the corrected rate of *remember* judgements for missing exemplars, $t(36) = 1.64$, *ns*.

Know judgements

The same set of analyses was performed on corrected *know* judgements. Corrected *know* judgements were calculated by taking the proportion of *know* judgements for targets, critical lures, and missing exemplars and subtracting the rate of *know* judgements for target controls, critical lure controls, and missing exemplar controls respectively. These results are shown in Table 1. Corrected *know* judgements varied as a function of item type, $F(2, 72) = 5.77$, $MSE = .018$. Pairwise comparisons indicated that the corrected rate of know judgements was greater for targets than for missing exemplars, $t(37) = 2.25$, and was greater for critical lures than missing exemplars, $t(37) = 4.05$.

Evidence for content borrowing

Our purpose in this experiment was to determine the role of content borrowing in producing false remember judgements. Based on prior research (Lampinen et al., 2005a) we hypothesised that for many false remember judgements participants would recall actual details that they had mentioned in response to particular studied items, but they would falsely recall those details as having been associated with the critical lures or missing exemplars. To test this hypothesis participants were asked to think out loud both while studying DRM lists and while taking a recognition memory test. These think-out-loud protocols were then coded for the occurrence of content borrowing. As in previous research, we coded both for clear cases of content borrowing as well as probable

Downloaded by [The University of Manchester Library] at 23:42 07 December 2014

content borrowing. Content borrowing was coded when, at time of test, in response to a critical lure or missing exemplar participants mentioned a specific detail that had actually been mentioned in response to a studied item. For instance, one participant said upon studying the word *seat*, "It makes me think of sitting down, and I'll rate that a 2. I don't care for that." On the test they falsely recognised the critical lure *chair* saying, "Chair is an old word. I didn't like to sit down." Probable content borrowing was used for cases that were less clear-cut. In these cases, it was judged that it was reasonable to conclude that content borrowing was occurring, but this judgement could not be made with certainty. For instance, upon viewing the word *mad* a participant said, "I give it a 1 because I hate it when people are mad at me, it makes me feel sad, so I give it a 1." Later on the test in response to the critical lure *anger* the participant said, "I think it is old, I can remember giving it a 1 b/c I don't like it when people are angry." When judging whether or not content borrowing occurred, two independent raters (i.e., the second and third author), agreed on 92.94% of all judgements. When judging whether or not probable content borrowing occurred, the two independent raters agreed on 91.99% of all judgements. Disagreements between the two raters were resolved by discussion.

This approach to the coding of the think-out-loud protocols allowed us to analyse content borrowing using a relatively conservative criterion (i.e., taking into consideration clear content borrowing only) as well as using a relatively less conservative criterion (i.e., taking into account both clear content borrowing and probable content borrowing). The proportion of critical lures and missing exemplars for which content borrowing was coded are shown in Figure 1. As can be seen, content borrowing was quite common, especially for critical lures and especially after the 2-week retention interval.

To examine the effect of retention interval and type of lure on content borrowing, a 2 (Retention Interval: Immediate, 2 Weeks) $\times$ 2 (Item type: Critical Lure, Missing Exemplar) mixed factorial ANOVA was conducted on the number of times content borrowing was coded. For the first analysis, the analysis was restricted to only those cases where clear content borrowing was coded. The results indicated that content borrowing was coded more commonly for critical lures than it was for missing exemplars, $F(1, 33) = 52.59$, $MSE = .81$. Importantly, content borrowing was coded more commonly when participants were tested 2 weeks after the study session than when they were tested immediately after the study session, $F(1, 33) = 5.85$, $MSE = .98$.

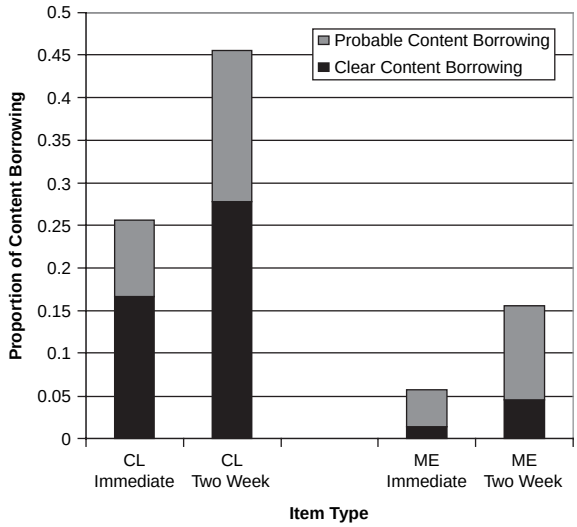


Figure 1. Effects of retention interval and item type on the occurrence of content borrowing and probable content borrowing.

The same analysis was conducted using a less stringent criterion for what constituted content borrowing. For this analysis we included both cases that were coded as clear content borrowing and cases that were coded as probable content borrowing. The results were consistent with the previous analysis. Content borrowing was coded more commonly for critical lures than it was for missing exemplars, $F(1, 33) = 95.14$, $MSE = .81$. In addition, content borrowing was coded more commonly after 2 weeks than when participants were tested immediately, $F(1, 33) = 11.31$, $MSE = 2.51$.

These findings are consistent with the predictions of the familiarity plus corroboration model. According to the model, search for corroborating details is driven by strong feelings of familiarity. Because critical lures should be more likely to engender a strong feeling of familiarity than missing exemplars, content borrowing should occur more frequently for critical lures. Additionally, the model predicts that content borrowing should be more common at long retention intervals than at short retention intervals. This is because, as time passes, features that are associated with studied items are more likely to become free floating and available for content borrowing.

Downloaded by [The University of Manchester Library] at 23:42 07 December 2014

GENERAL DISCUSSION

It is not surprising that we sometimes report past events in a way that diverges from historical reality. This is especially true when our memory reports match the overall gist of what occurred. Biological systems are not designed to maintain perfect veridicality. But what explains the subjective sense of *apparent veridicality* that accompanies so many of our false memories (Lampinen & Odegard, 2006)?

Elsewhere we have proposed a familiarity plus corroboration model in order to address this question (Lampinen, 1996; Lampinen et al., 2000; Lampinen et al., 2005; Lampinen et al., 1999; Odegard & Lampinen, 2004). The familiarity plus corroboration model starts with the assumption that vivid false memories are driven by a strong feeling of familiarity. This familiarity can be driven by either conceptual or perceptual similarity between the studied items and the test items. According to the model, this overwhelming feeling of familiarity drives a biased search of episodic memory for details that would tend to corroborate that feeling of familiarity. Under some circumstances a person may retrieve actual details from studied targets that tend to errantly corroborate the occurrence of a false memory item (in the DRM paradigm a critical lure). We have called this process *content borrowing*.

The present research joins other recent research from our lab demonstrating the occurrence of content borrowing (Lampinen et al., 2005). In the present experiment, content borrowing or probable content borrowing occurred for more than 25% of the critical lures on the recognition test, when participants were tested immediately, and more than 45% of the critical lures when tested after a 2-week retention interval. The results of the present research thus demonstrate that content borrowing is a robust mechanism in producing compelling memory illusions.

The present research was also motivated by two clear predictions of the familiarity plus corroboration account. First, because the familiarity plus corroboration account claims that the search process is driven by strong feelings of familiarity, content borrowing should be more common when the recognition memory lure is highly familiar. We tested this prediction by comparing critical lures, which should provoke strong feelings of familiarity, with missing exemplars, which should provoke weaker feelings of familiarity. Consistent with our predictions, content borrowing was more common for critical lures.

Second, because the familiarity plus corroboration model claims that features are borrowed from presented items in order to corroborate the occurrence of non-presented items, it follows that content borrowing should become more common as features become dissociated from their original source (as long as the features themselves are still available to be remembered). To test this prediction, participants were tested either immediately after the presentation of the study list, or after a 2-week delay. Consistent with our predictions, content borrowing increased as the retention interval was lengthened.

Recent research in unconscious plagiarism has also demonstrated that content from memories for experienced events can be borrowed to create experientially compelling false memories. In this research, Stark and Perfect (2006) asked participants to elaborate on or improve both their own ideas as well as ideas generated by other participants. The effect of elaborating on ideas increased the probability that participants would falsely claim to have generated the idea themselves. Similar results were reported by Stark, Perfect, and Newstead (2005). On the familiarity plus corroboration account, these results can be explained in terms of the feelings of familiarity evoked by the other participants' ideas as well as content borrowing of the participant's elaborations on those ideas.

The present research adds to our understanding of the processes that produce vivid false memories. In particular, we have provided additional evidence that participants sometimes correctly recall features that are associated with items that have actually been presented, and mistakenly convince themselves that those features had been associated with related by non-presented items.

Manuscript accepted 19 November 2007
First published online 18 January 2008

REFERENCES

Brainerd, C. J., Holliday, R. E., & Reyna, V. F. (2004). Behavioural measurement of remembering phenomenologies: So simple a child can do it. *Child Development*, *75*, 505–522.

Brainerd, C. J., Payne, D. G., Wright, R., & Reyna, V. F. (2003). Phantom recall. *Journal of Memory & Language*, *48*, 445–467.

Brainerd, C. J., Wright, R., Reyna, V. F., & Mojardin, A. H. (2001). Conjoint recognition and phantom recollection. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *27*, 307–327.

Deese, J. (1959). On the prediction of occurrence of particular verbal intrusions in immediate recall. *Journal of Experimental Psychology*, *58*, 17–22.

Ericsson, K. A., & Simon, H. A. (1993). *Protocol analysis: Verbal reports as data*. Cambridge, MA: The MIT Press.

Gallo, D. A., Roberts, M. J., & Seamon, J. G. (1997). Remembering words not presented in lists: Can we avoid creating false memories? *Psychonomic Bulletin & Review*, *4*, 271–276.

Gallo, D. A., & Roediger, H. L. (2003). The effects of associations and aging on illusory recollection. *Memory & Cognition*, *31*, 1036–1044.

Gallo, D. A., Roediger, H. L., & McDermott, K. B. (2001). Associative false recognition occurs without strategic criterion shifts. *Psychonomic Bulletin & Review*, *8*, 579–586.

Lampinen, J. M. (1996). *Recollections of things schematic: Influence of scripts on recollective experience.* Unpublished doctoral dissertation. Northwestern University, Evanston, IL.

Lampinen, J. M., Faries, J. M., Neuschatz, J. S., & Toglia, M. P. (2000). Recollections of things schematic: The influence of scripts on recollective experience. *Applied Cognitive Psychology*, *14*, 543–554.

Lampinen, J. M., Meier, C., Arnal, J. A., & Leding, J. K. (2005a). Compelling untruths: Content borrowing and vivid false memories. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *31*, 954–963.

Lampinen, J. M., Neuschatz, J. S., & Payne, D. G. (1998). Memory illusions and consciousness: Examining the phenomenology of true and false memories. *Current Psychology: Developmental, Learning, Personality, Social*, *16*, 181–224.

Lampinen, J. M., Neuschatz, J. S., & Payne, D. G. (1999). Source attributions and false memories: A test of the demand characteristics account. *Psychonomic Bulletin & Review*, *6*, 130–135.

Lampinen, J. M., & Odegard, T. N. (2006). Memory editing mechanisms. *Memory*, *14*, 649–654.

Lampinen, J. M., Odegard, T. N., Blackshear, E., & Toglia, M. P. (2005b). Phantom ROC. In F. Columbus (Ed.), *Progress in experimental psychology research*. Hauppauge NY: Nova.

Lampinen, J. M., Odegard, T. N., & Neuschatz, J. S. (2004). Robust recollection rejection in the memory conjunction paradigm. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *30*, 332–342.

Lampinen, J. M., Watkins, K. N., & Odegard, T. N. (2006). Phantom ROC: Recollection rejection in a hybrid conjoint recognition signal detection model. *Memory*, *14*, 655–671.

McDermott, K. B., & Roediger, H. L. (1998). Attempting to avoid illusory memories: Robust false recognition of associates persists under conditions of explicit warnings and immediate testing. *Journal of Memory & Language*, *39*, 508–520.

Neuschatz, J. S., Benoit, G. E., & Payne, D. G. (2003). Effective warnings in the Deese-Roediger-McDermott false-memory paradigm: The role of identifiability. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *29*, 35–41.

Neuschatz, J. S., Payne, D. G., Lampinen, J. M., & Toglia, M. P. (2001). Assessing the effectiveness of warnings and the phenomenological characteristics of false memories. *Memory*, *9*, 53–71.

Odegard, T. N., & Lampinen, J. M. (2004). Memory conjunction errors for autobiographical events: More than just familiarity. *Memory*, *12*, 288–300.

Payne, D. G., Elie, C. J., Blackwell, J. M., & Neuschatz, J. S. (1996). Memory illusions: Recalling, recognising, and recollecting events that never occurred. *Journal of Memory & Language*, *35*, 261–285.

Pesta, B. J., & Murphy, M. D. (2001). Are emotionally charged lures immune to false memory? *Journal of Experimental Psychology: Learning, Memory, Cognition*, *27*, 328–338.

Rajaram, S. (1993). Remembering and knowing: Two means of access to the personal past. *Memory & Cognition*, *21*, 89–102.

Read, J. D. (1996). From a passing thought to a false memory in 2 minutes: Confusing real and illusory events. *Psychonomic Bulletin & Review*, *3*, 105–111.

Reyna, V. F., & Kiernan, B. (1995). Children's memory and metaphorical interpretation. *Metaphor & Symbol*, *10*, 309–331.

Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, Cognition*, *21*, 803–814.

Stadler, M. A., Roediger, H. L., & McDermott, K. B. (1999). Norms for word lists that create false memories. *Memory & Cognition*, *27*, 494–500.

Stark, L. J., & Perfect, T. J. (2006). Elaboration inflation: How your ideas become mine. *Applied Cognitive Psychology*, *20*, 641–648.

Stark, L. J., Perfect, T. J., & Newstead, S. E. (2005). When elaboration leads to appropriation: Unconscious plagiarism in a creative task. *Memory*, *13*, 561–573.

Tulving, E. (1985). Memory and consciousness. *Canadian Psychology*, *26*, 1–12.

Downloaded by [The University of Manchester Library] at 23:42 07 December 2014